AN AJSS An Asian Journal of Soil Science
Volume 11 | Issue 2 | December, 2016 | 337-340 | e ISSN–0976–7231 ■ Visit us : www.researchjournal.co.in

Research Article

DOI : 10.15740/HAS/AJSS/11.2/337-340

Micronutrient status in soils of chilli grown areas of UKP command area, Karnataka

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Received : 05.08.2016; **Revised :** 29.10.2016; **Accepted :** 22.11.2016

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Summary

An investigation was carried out to study the micronutrients status in soils of chilli grown areas of UKP command at College of Agriculture, Raichur, during the year 2006-07. The concentration of iron and manganese in soil samples collected before the crop season ranged from 3.95 to 4.95 ppm and 23.03 to 25.87 ppm, respectively and their concentration increased after the harvest of the crop. Similarly, the soil samples of experimental sites recorded moderate levels of micronutrients did not vary significantly but the soil supplemented with organic manures (Category-2 and category-4) recorded higher levels of micronutrients compared to no organic manure added chilli cultivated soil samples (Category-3).

Key words : Nutrient management practices, DTPA extractable micronutrients, Command area, Chilli, Soil fertility

How to cite this article : Shivakumar, K.M. and Nagaraja, M.S. (2016).Micronutrient status in soils of chilli grown areas of UKP command area, Karnataka. *Asian J. Soil Sci.*, **11** (2) : 337-340 : **DOI : 10.15740/HAS/AJSS/11.2/337-340.**

Introduction

Chilli is an important export oriented crop, suitable for both tropical and subtropical regions, can be grown throughout the year. In India, 3/4th of chilli cultivation is seen in Deccan plateau covering large tracts of Andhra Pradesh, Karnataka, Maharastra and Tamil Nadu states (Anonymous, 2005). Most of the Indian chillies belong to *Capsicum annum* species and the genotypes of both hybrids and HYV are in use for higher commercial value. This drought tolerant crop is highly sensitive to ill drained water logged conditions. In Karnataka, this crop is commercially grown mostly in irrigated areas with intensive management practices.

Chilli was introduced to the UKP command by migrated farmers from Andhra Pradesh. These migrated farmers cultivated chilli on leased lands with intensive production technologies. Today, the crop (both HYV and hybrids) is being grown even by local farmers with varied levels of nutrient management practices. Some of the farmers with low risk bearing capacity are cultivating chilli with application of moderate levels of fertilizers and organic manures. On the other hand, some of the local chilli farmers are applying high amounts of organic manures along with moderate quantities of fertilizers. Thus, the nutrient management practices adopted in chilli production varied to a great extent. it was hypothesized that high variability in chilli productivity is linked to nutrient management practices which in turn will have an influence on soil fertility status. Keeping this in view, a study was proposed to assessment of micronutrient status in soils of chilli grown area of UKP command, Karnataka.

Resource and Research Methods

In the UKP command, the chilli farmers are spread over a large area. However, the study was restricted to a smaller representative area within Shahapur, Surpur and Muddebihal taluks. The average annual rainfall in this region was 768 mm of which nearly 3/4th and it occurs during the months of June to September from South-West monsoon. The UKP command area broadly consisted of two types of black soils – deep black soils (Vertisols) and shallow to medium deep black soils (Vertisols and Inceptisols) as well as red soils (Alfisols) with 59, 27 and 14 per cent, respectively. The soils have ustic soil moisture regime and isothermic soil temperature regime.

Categorization of farmers :

An initial survey was carried out in the study area to abstract different chilli cultivation practices adopted by the farmers. It was interesting to note that the nutrient management appeared to be a key influencing factor for chilli production compared to other production variables. There was a marked difference in terms of the nutrients applied and their respective yields. Thus, the farmers were grouped into 3 different categories based on the quantities of fertilizers and organic manures (OM) applied. They were grouped as local farmers (with moderate fertilizer + low OM) as category-1; migrated farmers (with high fertilizer + No OM) as category-2; and high OM appliers (with moderate Fert. + high OM) as category-3 group of chilli farmers. The dry chilli yield was measured individually and in some cases from the records maintained for the companies under contract farming.

Soil sampling :

The surface soil samples (0-15 cm and 15-30 cm) were collected from above said categories of farmers before transplanting/ sowing of the new of crop (during June, 06) and after the harvest of the crop (during February, 2007). The soil samples were dried in shade and passed through 2 mm sieve after powdering gently with wooden pestle and mortar. The air dried soil samples were stored in air tight container for further chemical analysis.

Soil analysis :

The collected soil samples were extracted with DTPA buffer and the filtrate was fed to Gerhardt make (GB-20) Atomic Absorption Spectrophotometer. The concentration of Fe, Mn, Zn and Cu were determined using suitable cathode lamps in the AAS (Lindsay and Norwell, 1978).

Research Findings and Discussion

The soil samples drawn from different chilli fields were analyzed for their micronutrient status. The nutrient management practices had significant effect on soil fertility status. The concentration of iron and manganese in soil samples collected before the crop season ranged from 3.95 to 4.95 ppm and 23.03 to 25.87 ppm, respectively and their concentration increased after the harvest of the crop. Interestingly, iron availability increased with organic manure applications as evidenced in soils of category-2 (4.83 ± 0.89 ppm) and Category-4 (5.11 ± 0.85 ppm) groups of farmers (Table 1). Similarly, The availability of zinc before transplanting was in the range of 0.70 to 0.88 ppm, while it increased at the end of the growing season. Among chilli grown soils, the DTPA- Zn was found highest (1.35 ± 0.40 ppm) in Category-3 farmers while, it was slightly less in category - 2 (1.14 ± 0.36) and category- 4 (1.44 ± 0.61) group of

Table 1 : Changes in DTPA extractable Fe and Mn contents in soils among different categories of farmers

Category of farmers	DTPA extractable Fe (ppm)			DTPA extractable Mn (ppm)		
	Before	After	Paired t-test	Before	After	Paired t-test
Category-1	4.02 ± 0.99	4.04 ± 0.66	NS	23.03 ± 2.46	27.63 ± 5.02	*
Category-2	4.24 ± 0.68	4.83 ± 0.89	NS	24.35 ± 4.84	29.92 ± 5.41	*
Category-3	3.95 ± 0.62	3.98 ± 0.68	NS	24.34 ± 6.81	29.71 ± 5.59	*
Category-4	4.95 ± 0.68	5.11 ± 0.85	NS	25.87 ± 3.47	31.15 ± 6.27	*
S.E.± (With in category)	0.49 *	NS		NS	NS	
S.E.± (Between category)	1.79 *	2.20 *		NS	NS	

Note: Category-1: Non chilli farmers; Category-2: Chilli farmers with moderate fertilizer and low organic manures
Category-3: Chilli farmers with high fertilizer and no organic manure; Category-4: Chilli farmers with moderate fertilizer and high organic manures NS= Non-significant * indicates significance of value at P=0.05

farmers (Table 2). However, the soil samples of the experimental sites recorded moderate levels of DTPA extractable iron, manganese, zinc and copper and they did not vary significantly (Fig.1). However, The soils supplemented with organic manures (Category-2 and 4) recorded higher amounts of micronutrients compared to no organic manure additions (Category-3) (Table 2). This may be attributed to organic matter additions in the form of litter, root exudates etc, during the crop season, might have enhanced their availability. Similar reports were made by Bellakki and Badanur (1997); Sharma (2001), Siddesh (2006); Swetha (2007) and Vidyavathi *et al.*

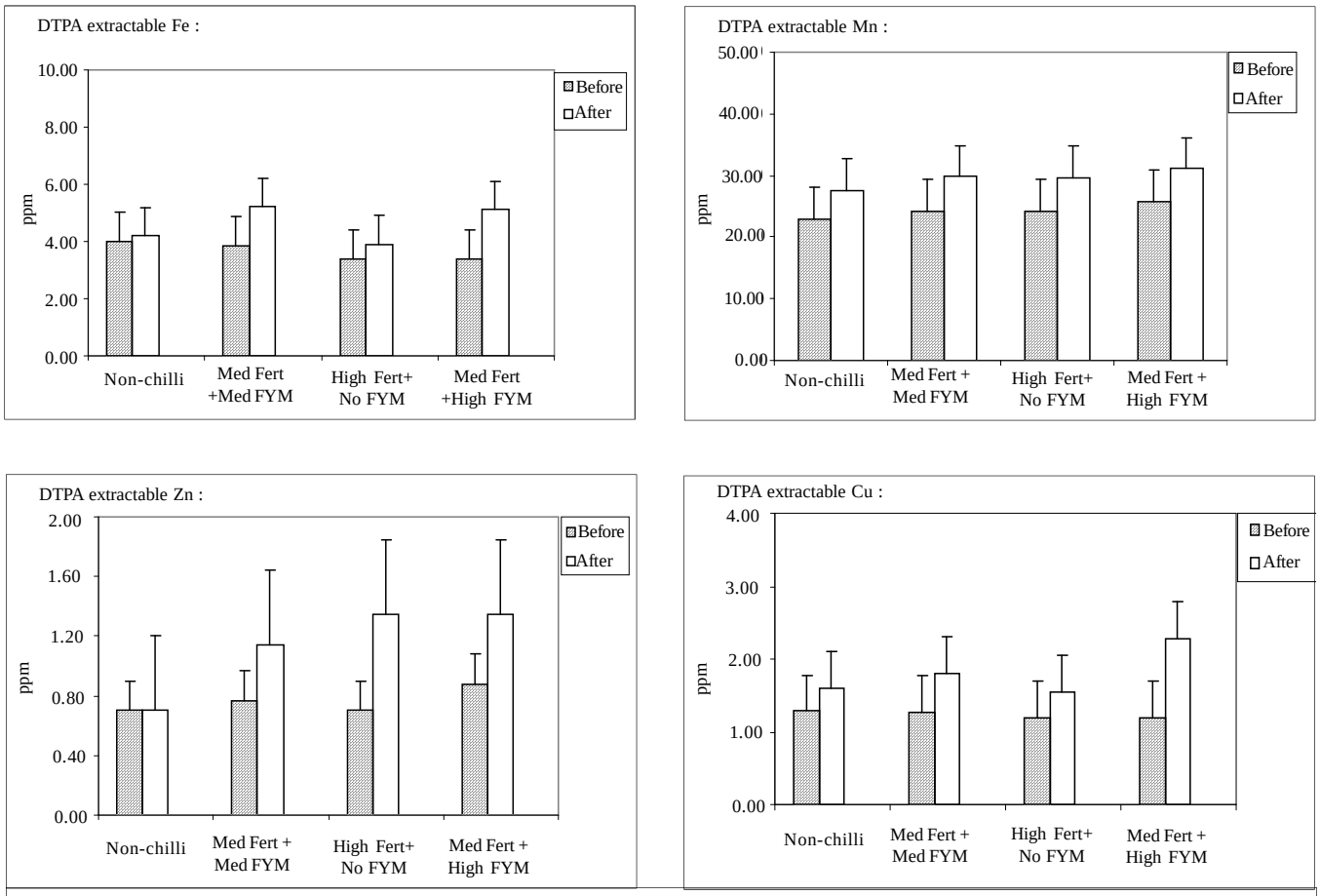

Fig. 1 : Changes in DTPA- extractable micronutrients in soils among different categories of farmers

Table 2 : Changes in DTPA extractable Zn and Cu contents in soils among different categories of farmers

Category of farmers	DTPA extractable Zn (ppm)			DTPA extractable Cu (ppm)		
	Before	After	Paired t-test	Before	After	Paired t-test
Category-1	0.70 ± 0.20	0.78 ± 0.26	NS	1.35 ± 0.30	1.59 ± 0.16	*
Category-2	0.77 ± 0.35	1.14 ± 0.36	*	1.28 ± 0.39	1.80 ± 0.36	*
Category-3	0.70 ± 0.49	1.35 ± 0.40	*	1.27 ± 0.43	1.55 ± 0.19	*
Category-4	0.88 ± 0.57	1.44 ± 0.61	*	1.20 ± 0.69	2.29 ± 0.21	*
S.E.± (With in category)	NS	NS		NS	NS	
S.E.± (Between category)	NS	NS		NS	NS	

Note: Category-1: Non chilli farmers; Category-2: Chilli farmers with moderate fertilizer and low organic manures
Category-3: Chilli farmers with high fertilizer and no organic manure Category-4: Chilli farmers with moderate fertilizer and high organic manures
NS= Non-significant * indicates significance of value at P=0.05

(2012). The application of organic manures might have further increased their availability (Madhavi *et al.*,1995 and Punithraj *et al.*, 2012). Chelating properties of organic molecules, released during the decomposition, might have helped to keep micronutrients in available forms (Borah *et al.*, 1992 and Kumar and Shivay, 2010). No changes in micronutrient availability in Category-3 group of farmers even after the crop harvest may be due to no or least organic manure additions (Ginting *et al.*, 2003). This may also be due to higher pH as observed in this study. The soil pH is also an important factor to determine the solubility of minerals (Lindsay and Norwell, 1978 and Harmosen and Vlek, 1985). The solubility of micronutrient containing minerals might have decreased with raise in soil pH as observed in Catergory-3 group of farmers resulting in low availability.

Conclusion :

The present study reveals that the farmers growing chilli with application of organic and inorganic nutrients (Category-2 and 4 chilli cultivating farmer) recorded higher available micronutrients status compared to no organic manure additions (Category-3). To achieve higher chilli productivity the supplementation of nutrients through fertilizer and organic manure is important. Otherwise, it would result in low nutrient use efficiency and altered the important soil chemical properties. Hence, there is need to educate the migrated farmers (Category-3) for judicious use of chemical fertilizer to maintain sustainable soil health.

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